### Ozone standards and health effects

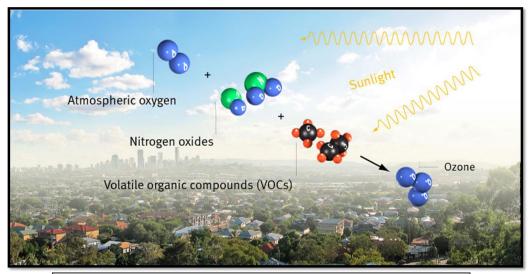
- National Ambient Air Quality Standards (NAAQS) currently in effect
  - 2015: 0.070 ppm (or 70 ppb)
  - 2008: 0.075 ppm (or 75 ppb)
  - Both defined as the 3-year average of the daily 4th maximum 8-hour values (truncated)
- Health effects
  - Irritates the airways and reduces lung function, causing coughing, sore or scratchy throat, and shortness of breath
  - Aggravates chronic lung diseases such as asthma, emphysema and bronchitis
  - Increased risk of premature death in people with heart and lung disease
  - Groups at risk include:
    - People with lung disease, especially children with asthma
    - · Children and older adults
    - People who are active outside, especially children and people who work outdoors

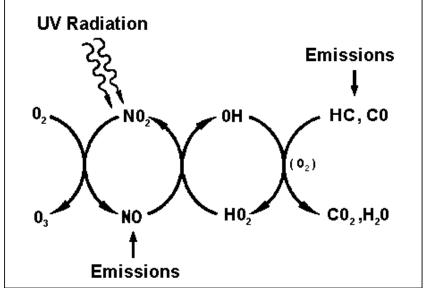
Analogy: 1 ppb is 1 drop in a large gas tanker truck



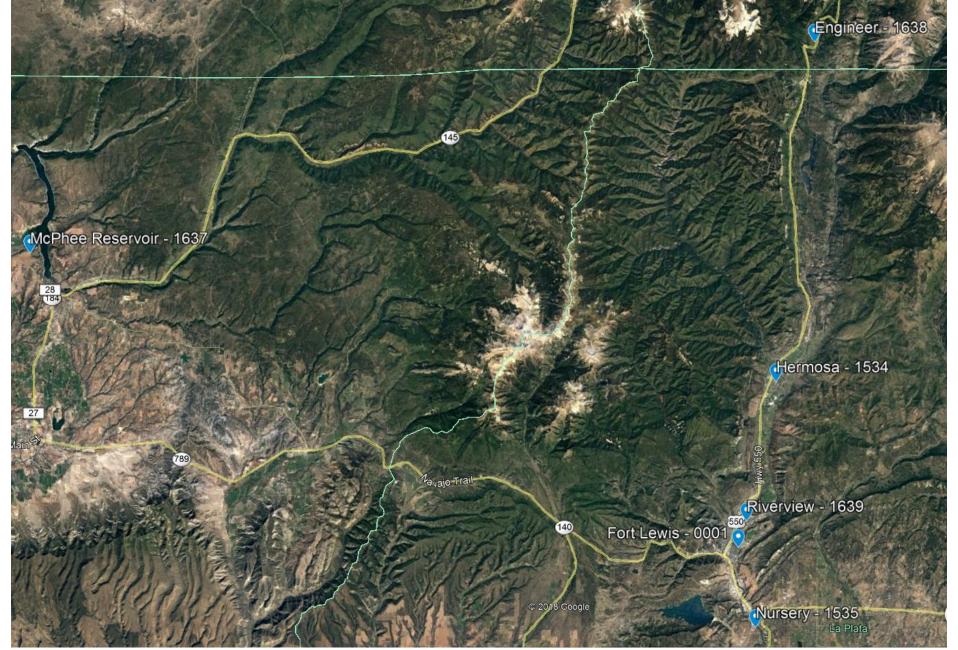
### Ozone formation

- Typically not directly emitted but secondarily formed
- Formed through complex interaction between volatile organic compounds (VOCs) and nitrogen oxides (NOx) in presence of sunlight
- Highest ground-level ozone concentrations usually occur in the summer
- Precursor emissions include:
  - motor vehicles
  - industry
  - oil and gas production
  - Biogenic (i.e. vegetation)



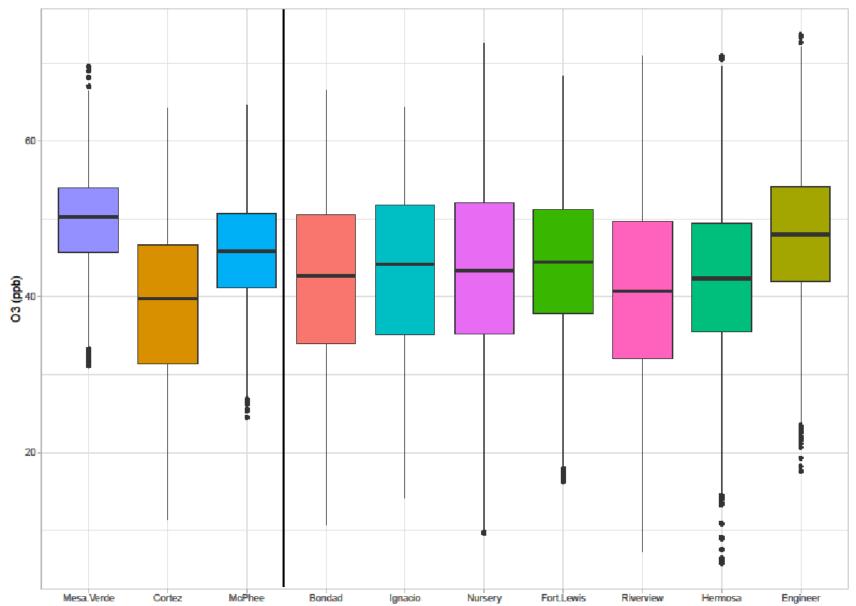






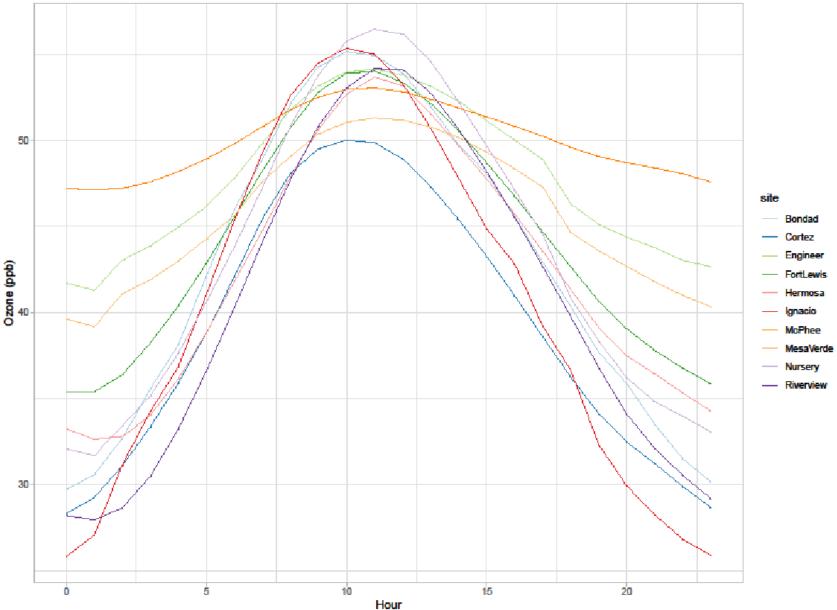


#### Box Plot South to north





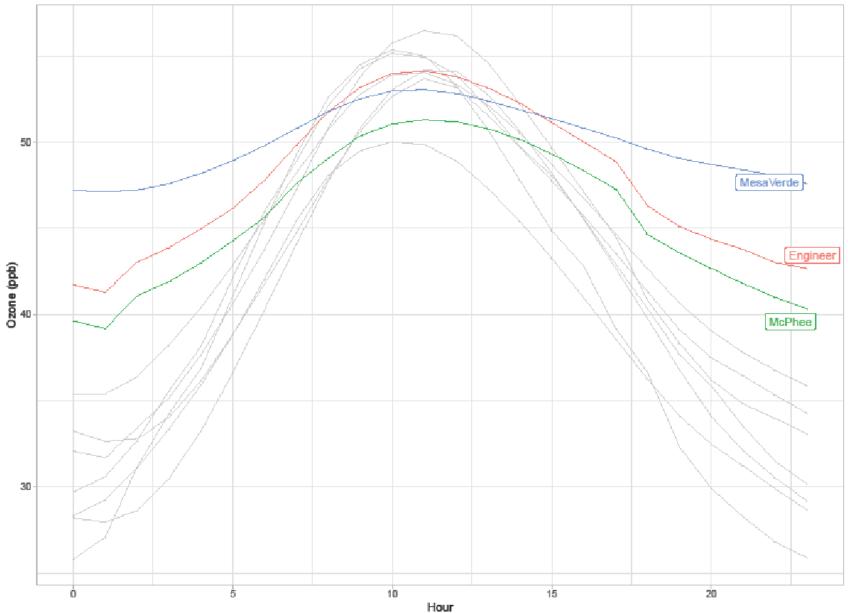
#### Average ozone concentration per hour of day





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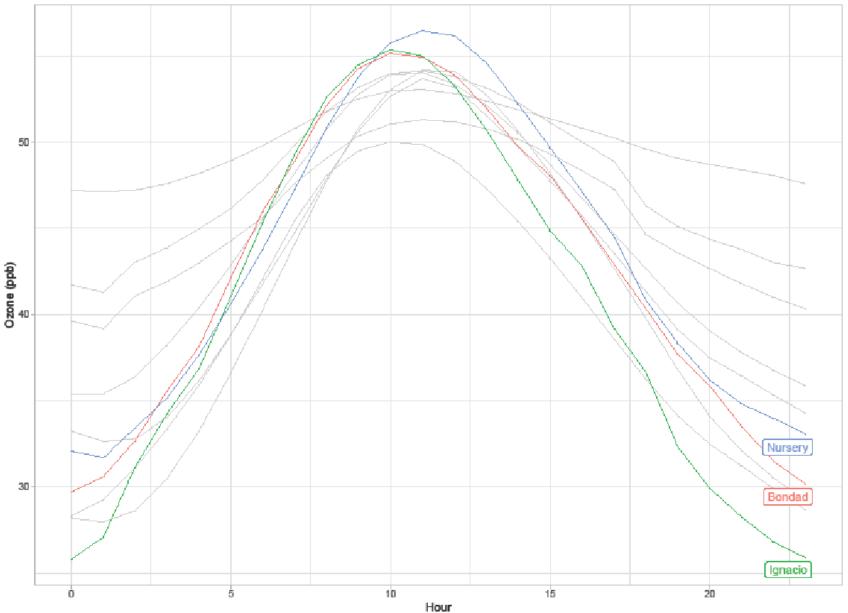
# Least Anthropogenic Influence per hour of day





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### Highest Mid-day Averages per hour of day

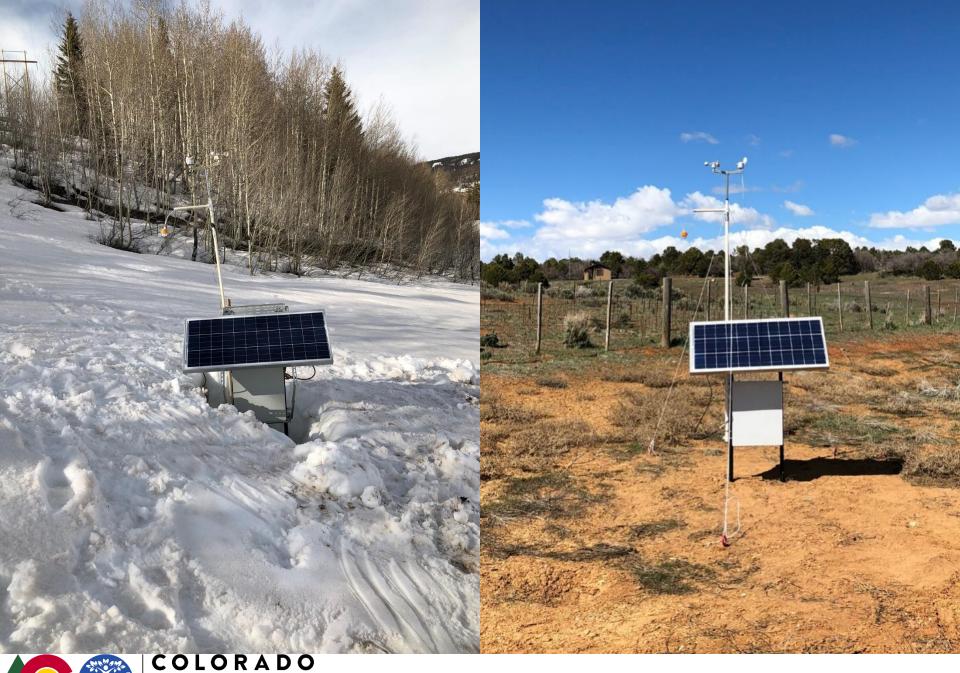




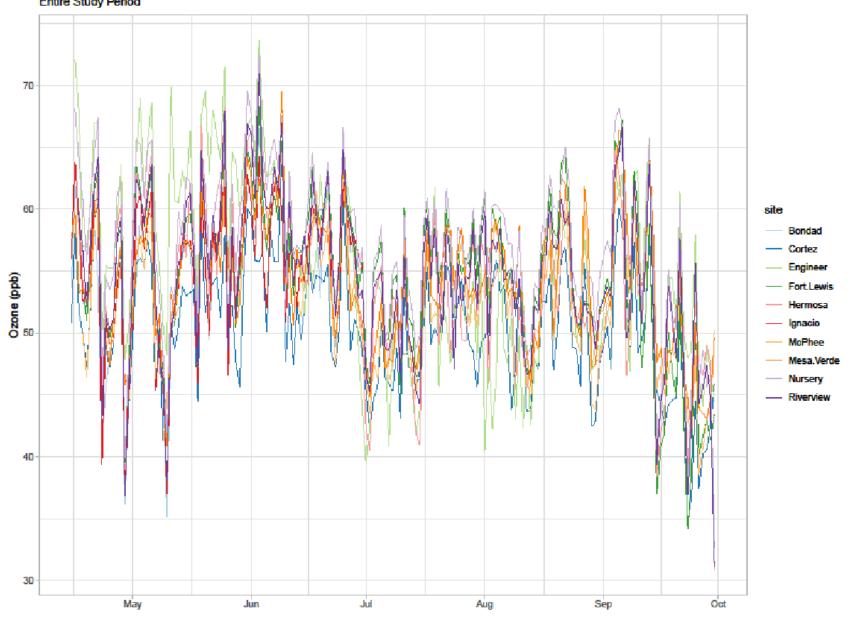
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		A	oril-201	19				May-2019							June-2019						
30	31	1	2	3	4	5	27	28	29	30	•	2	3	25	25	27	28	23	30	31	
6	7	8	9	100	11	12	4	5	6	7	8	9	10	•	2	3	4	5	6	7	55
13	14	15	16	17	12	19	11	12	13	14	15	16	17		9	10	11	12	13	14	
20	21	22	23	24	25	25	18	19	200	21	22	23	24	15	16	17	18	19	20	21	
27	28	25	30	-1	2	3	25	26	27	28	29	30	31	22	23	24	25	25	27	28	50
4	5	6	7	8	9	10	1	2	3	4	5	6	7	29	30	1	2	3	4	5	
s	S	М	Т	w	Т	F	S	S	М	Т	w	Т	F	s	s	М	Т	w	Т	F	45
July-2019								August-2019							September-2019						
25	30	1	2	3	•	5	27	28	25	30	31	1	2	31	1	2	3	•	5	6	
6	7	8	9	10	11	12	3	4	5	6	7		9	7		9	10	11	12	13	40
13	14	15	16	17	18	19	10	11	12	13	14	15	16	14	15	16	17	18	19	20	
20	21	22	23	24	25	25	17	18	19	20	21	22	23	21	22	23	24	25	25	27	
27	28	29	30	31	1	2	24	25	26	27	28	29	30	28	25	30	1	2	3	4	35
3	4	5	6	7	8	9	31	1	2	3	4	5	6	5	6	7	8	9	10	11	
s	s	м	т	w	т	F	S	s	М	т	w	т	F	s	s	м	т	w	т	F	





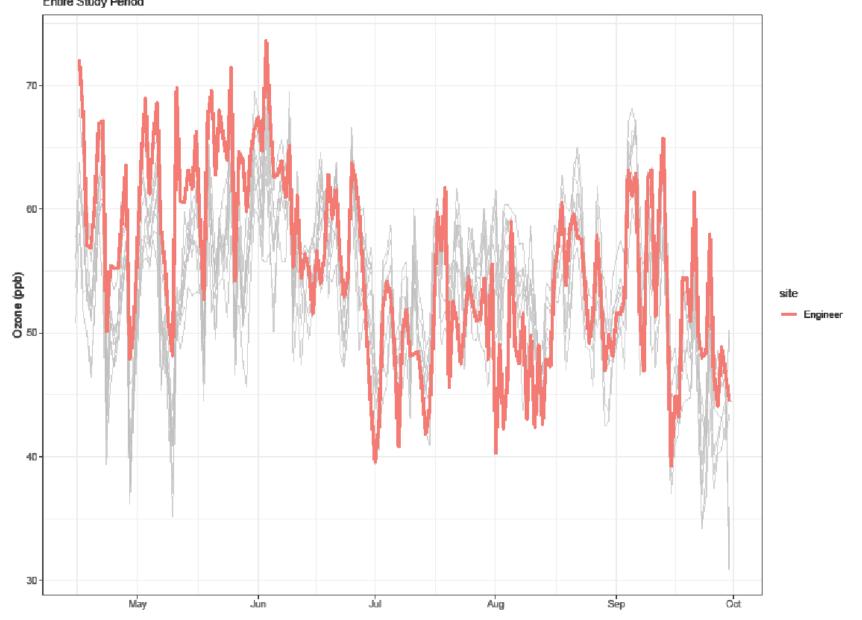
### Daily Maximum 8-hour Concentrations Entire Study Period





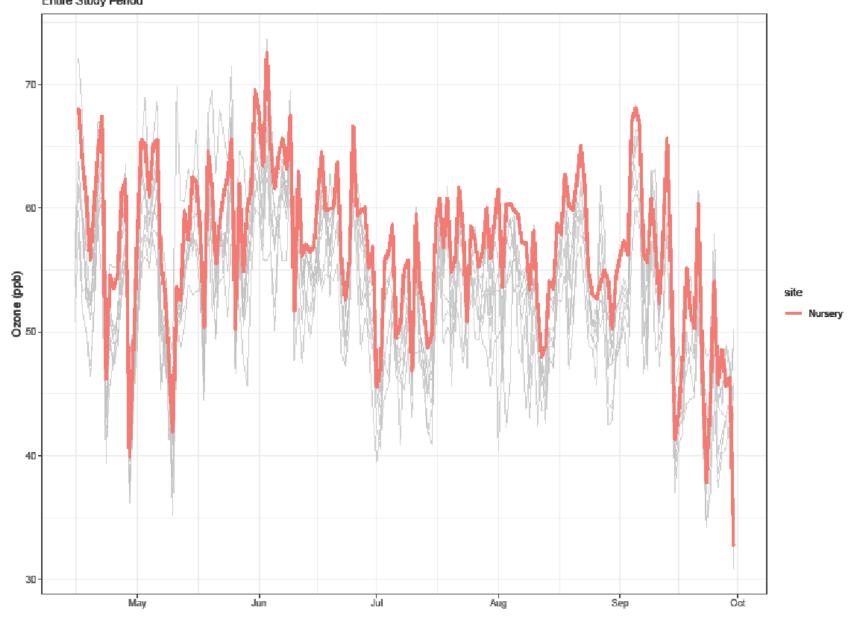
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### Daily Maximum 8-hour Concentrations Entire Study Period



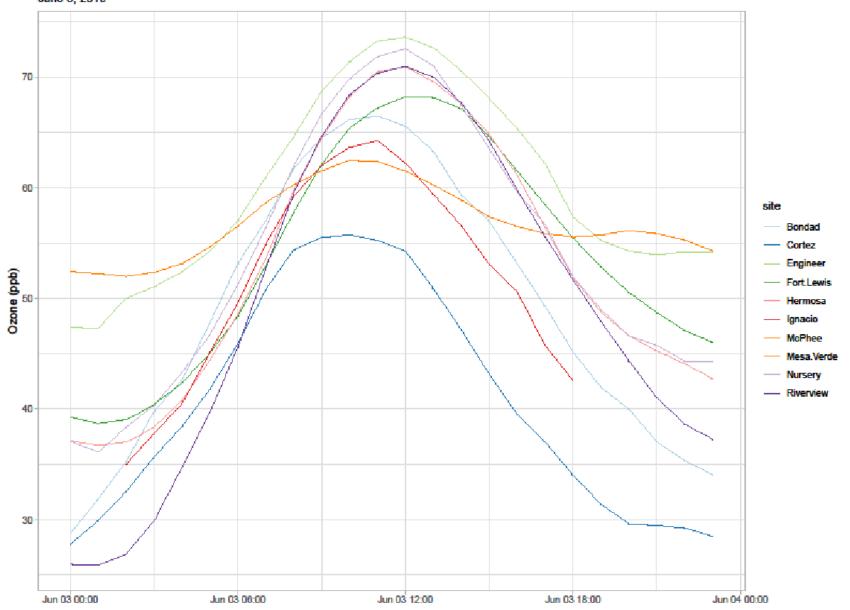


### Daily Maximum 8-hour Concentrations Entire Study Period



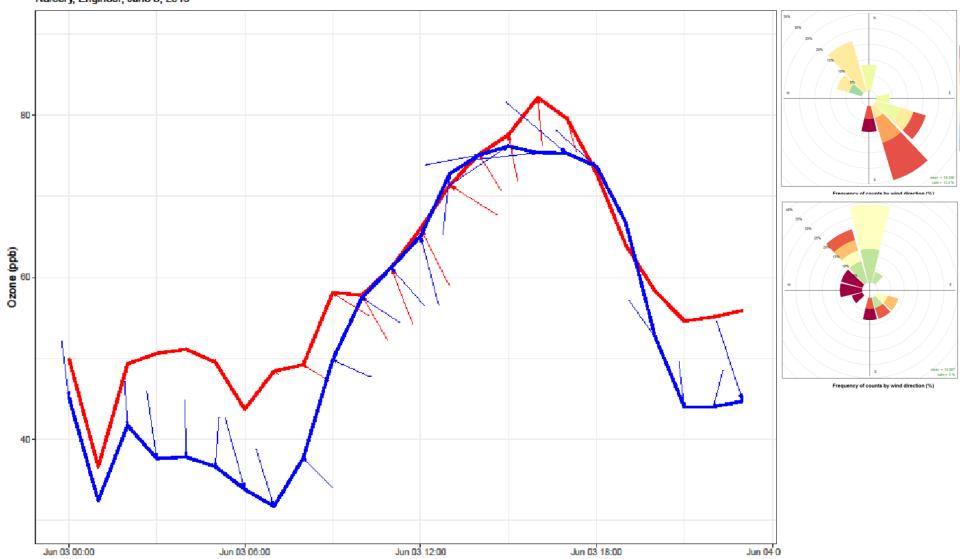


#### 8 Hour Average Concentrations June 3, 2019





## 8 Hour Ozone Concentrations and Wind Nursery, Engineer, June 3, 2019





Date: 2019-06-03 01:00:00 37.6 37.4 j <u>t</u> 37.2 37.0

-108.0

long

-107.5

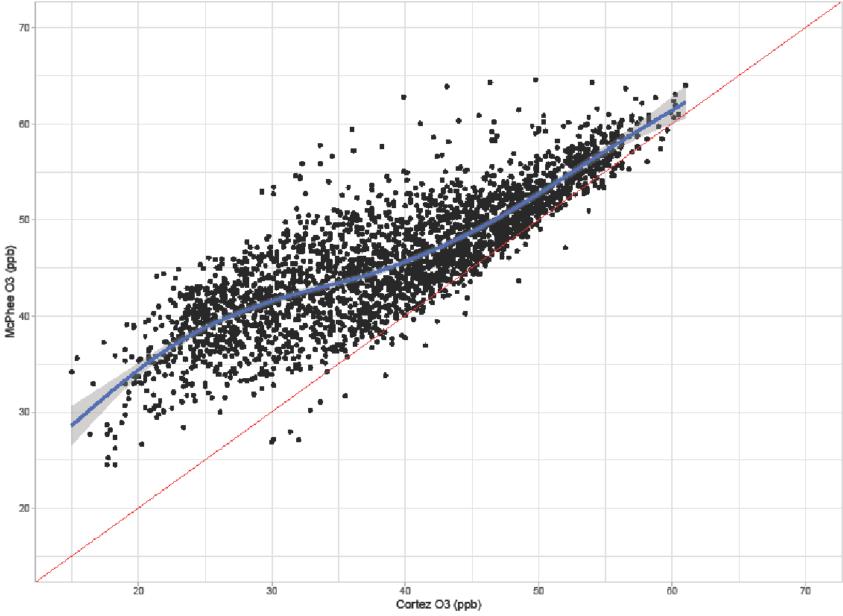


-109.0

-108.5

-107.0

#### McPhee and Cortez Regression Model





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